CLAIMS

1. A lip-type high pressure seal comprising an annular metallic casing, an annular sealing lip secured to said casing, and a low friction lining bonded to said sealing lip, characterized in that said sealing lip is made of a highly gas barrier, non-elastomeric, polymer material.

2. A lip-type seal according to claim 1, wherein said polymer material forming the sealing lip has a gas permeability coefficient of less than 1.0×10^{-13} ($cm^3 \cdot cm/cm^2 \cdot sec \cdot Pa$) for carbon dioxide gas under a pressure of 4 MPa.

3. A lip-type seal according to claim 2, wherein said polymer material has a gas permeability coefficient of less than 1.0×10^{-14} ($cm^3 \cdot cm/cm^2 \cdot sec \cdot Pa$) for carbon dioxide gas under a pressure of 4 MPa.

4. A lip-type seal according to one of claims 1-3, wherein said dealing lip is made of polyamide.

5. A lip-type seal according to one of claims 1-3, wherein said sealing lip is made of a polymer material selected from the group consisting of polyvinylidene fluoride, polyvinyl chloride, poly-chlorotrifluoroethylene, and polyvinyl alcohol.

6. A lip-type seal according to one of claims 1-5, wherein said low friction lining is made of polytetrafluoroethylene.

7. A lip-type seal according to one of claims 1-6, wherein said polymer material forming the sealing lip has a high modulus of elasticity.

8. A lip-type seal according to one of claims 1-7, wherein said low friction lining covers only a part of said sealing lip which is brought into contact with a shaft to be sealed.

SUB 93 9. A lip-type seal according to one of claims 1-8, wherein the ratio of the radial thickness of said low friction lining with respect to the radial thickness of said sealing lip is less than 20%.

10. A lip-type seal according to one of claims 1-9, wherein the inner circumferential face of said low friction lining is provided with helical pumping elements for hydrodynamically returning a fluid, having leaked from a sealed side to an atmospheric side, back to the sealed side.

11. A lip-type seal according to one of claims 1-10, further comprising a second sealing lip made of a resilient elastomeric material.

12. A method for establishing fluid seal between a housing containing a high pressure gas and a shaft rotating relative to said housing, said method comprising the steps of:

providing a lip-type seal having an annular sealing lip made from a highly gas barrier, non-elastomeric, polymer material;

lining the inner circumferential face of said sealing lip with a low friction lining;

installing said lip-type seal between said shaft and said housing in such a manner that only said low friction lining is brought into contact with said shaft; and,

applying a gas pressure higher than about 3 MPa to the fluid side of said seal as said shaft and said housing are rotated relative to each other to thereby cause said low friction lining to resiliently follow any shaft run-out under the action of high pressure gas, while substantially preventing permeation of gas by the highly gas barrier nature of said sealing lip.

13. A method according to claim 12, wherein said sealing lip causes the low friction lining into tight contact with the outer periphery of the shaft under the action of high pressure gas to thereby establish a static seal.

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14. A method according to claim 12 or 13, wherein said sealing lip is made of polyamide.

15. A method according to claim 12 or 13, wherein said sealing lip is made of a polymer material selected from the group consisting of polyvinylidene fluoride, polyvinyl chloride, polychlorotrifluoroethylene, and polyvinyl alcohol.

16. A method according to one of claims 12-15, wherein said low friction lining is made of polytetrafluoroethylene.